

REMARKS

As indicated above, this is a Preliminary Amendment in conjunction with the Request for Continued Examination filed on January 6, 2006.

Claim 2 has been amended in order to more particularly point out, and distinctly claim the subject matter to which the applicants regard as their invention. The applicants respectfully submit that no new matter has been added.

At this time, the applicants and undersigned thank Examiner R.G. McDonald for taking the time to conduct a telephone interview with the applicants' undersigned representative on January 19, 2006, and for the courtesy extended by the Examiner to the undersigned during the interview.

During the telephone interview, it was first pointed out to Examiner McDonald that the former Examiner (Mr. S.H. Versteeg) had previously argued (in items 23 - 25, page 6 of his September 12, 2005 Office Action) that the applicants' arguments were not supported by the claim language. (See, also, line 11, page 10 through line 1, page 12 of the December 12, 2005 Response.) It is for this reason that the applicants significantly amended the claims in their Response under 1.116 filed on December 16, 2006.

Second, Examiner McDonald was referred to sketches attached to the applicants' December 12, 2005 Response, and as argued in the December 12, 2005 Response (lines 10 and 11, page 12), Collins' series inductor 190 is not variable. It is for this reason that independent claim 2 has been amended herein so that the claimed "first main winding" is that "of said first variable inductance" in order to distinguish the claimed main winding over Collins' series inductor 190.

In other words, the matching box according to the applicants' instant claimed invention and the matching box described in Collins are different at the point of connecting variable inductance elements. Fig. a in the sketch sheet, attached to the December 12, 2005 Response, is a schematic circuit diagram simplified by omitting a capacitor from a matching box of the present invention. Fig. b of the same sketch sheet, attached to the December 12, 2005 Response, is a simplified schematic circuit diagram of a matching box according to Collins.

In the matching box of the applicants' instant claimed invention, "a first main winding" of "a first variable inductance element" is connected in series between a RF source and a coil. However, in the matching box of Collins, a capacitor of "pi-network" is merely replaced with a variable capacitory or a parallel connected circuit composed of a fixed capacitor and a variable inductor and series inductor 190 is not variable.

Third, as to independent claims 1, 5 and 9, the applicants' arguments, as previously presented to Examiner Versteeg on pages 16 through 19 of the Amendment filed July 26, 2005, were reiterated. That is, the applicants' invention is directed to a matching box 2 connected to a plasma generator 12, positive ion flow 20 being released from the plasma generator 12 into a vacuum chamber 11. Within the vacuum chamber 11, electrons generated by the ionization of ionization gas introduced into an electron generator 13 are applied to the positive ion flow 20, the electrons being neutralized by the positive ions. Neutral particles are then irradiated to a target 15 so that atoms of the target 15 are sputtered as sputtered particles 123, which in turn begin the formation of a thin film on the surface of a substrate 17. As described in lines 2 - 7, page 15 of the applicants' specification:

[t]he impedance of an electric circuit composed of the coil 42 and the ionization chamber 41 varies between before and after the generation of plasma 43 in the ionization chamber 41. Accordingly, it is necessary to match the impedance by varying the impedance inside the matching box 2 when the plasma 43 is formed.

In other words, the absence or existence (formation) of the plasma 43 within the ionization chamber 41 affects the necessary input power for the direct application of voltage to the coil 42 surrounding the ionization chamber 41. As more particularly explained in lines 10 - 17, page 18 of the applicants' specification:

[m]ore specifically, when the plasma 43 is generated in the ionization chamber 41, large input power is necessary. Accordingly, the inductance of the second variable inductance element 35 is increased to apply large voltage to the coil 42.

After the plasma 43 is formed once, the inductance of the second variable inductance element 35 is decreased so that the magnitude of voltage is optimally adjusted to stably maintain the plasma 43.

That is, the applicants' invention includes a controlled circuit 66, which specifically measures the current flowing through the coil 42 that surrounds the ionization chamber 41, the measurement of the magnitude of the current detecting the disappearance of plasma 43 within the ionization chamber 41, which in turn affects the impedance of the first and second variable inductance elements 31, 35 so as return to an impedance before the generation of plasma.

As a result, the applicants' invention has the effect of reducing the down time to less than 100 mS due to the disappearance and regeneration of plasma 43; thereby, not adversely affecting film thickness accuracy formed on the target 15.

On the other hand, although Collins detects current from a coil antenna, such detection of the current is accomplished as follows:

[a] current sensor 410 monitors the RF current to the coil antenna 120. A frequency servo 420 periodically samples the coil antenna current sensed by the current sensor 410 and uses that information to control the frequency of the RF source signal generator 140.¹¹

¹¹ See, lines 30-35, column 7 in Collins.

In other words, Collins requires a separate sensor 410 for monitoring the RF current of the coil antenna 120 so that the periodic detection of coil antenna current is used for controlling the frequency of the RF source signal generator 140.

In the applicants' invention, although a control circuit 66 is provided for measuring the current flowing through the coil 42, upon detection of the disappearance of plasma 43 by the measurement of the magnitude of the current, "the impedance of the first and second variable inductance elements 31 and 35 is returned to that before the generation of the plasma" (lines 8 - 12, page 19 of the applicants' specification). In other words, upon the detection of the disappearance of the plasma 43 by the measurement of the magnitude of the current, the inductance of the second variable inductance element 35 is increased so as to apply a large voltage to the coil 42. Upon the formation of plasma 43, the inductance of the second variable inductance 35 is decreased so that the magnitude of the voltage is optimally adjusted in the coil 42 so as to stably maintain the plasma 43.

Such structural arrangements of the applicants' claimed invention (i.e., the inductance of the variable inductance element being increased upon detection of the disappearance of plasma or the voltage outputted from the claimed matching box being increased by changing the current flowing through the claimed control winding upon detection of the disappearance of plasma) is distinguishable over Collins' use of the information concerning the current in the coil antenna 120 for controlling the frequency of an RF source signal generator 140.

In view of the above, the applicants' claimed invention is distinguishable over the teachings of Collins, and is not anticipated by the teachings of Collins. Thus, the withdrawal of the outstanding anticipation rejection under 35 USC 102(b) based on Collins is in order, and is therefore respectfully solicited.

In view of the aforementioned amendments and accompanying remarks, claims, as amended, are in condition for allowance, which action, at an early date, is requested.

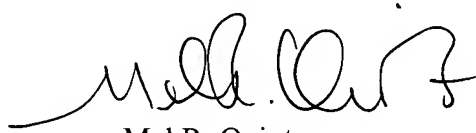
If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

U.S. Patent Application Serial No. 10/657,192
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In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper to Deposit Account No. 01-2340.

Respectfully submitted,

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